

GAU 2881, Ser. No. 09/815,282
Response to O.A. of January 30, 2004

IN THE CLAIMS

1. (currently amended): A method of controlling a scanning electron microscope, the method comprising the steps of:

irradiating a surface of an object with an a primary electron beam swept, in a scanning direction, over a fixed scanning range length; and

detecting secondary electrons released from the object due to the irradiation during a predetermined period constituting a portion of an a fixed primary electron beam scanning time, the primary electron beam scanning time comprising a single sweep of the primary electron beam in the scanning direction over the fixed scanning range length,

wherein the predetermined period is changed depending on a magnification for observing the object, without changing a scanning rate of the primary electron beam across the surface of the object.

2. (currently amended): The method as claimed in claim 1,

wherein the step of detecting secondary electrons further comprises extracting image data obtained during the predetermined period, and wherein the portion of the electron beam scanning time is proportional to the predetermined period; and

wherein the method further comprises a step of displaying an image at the magnification for observing the object, in accordance with the extracted image data.

3. (original): The method as claimed in claim 1, further comprising the steps of:

storing only data obtained during the predetermined period of time corresponding to the magnification from all data obtained as a result of the detection; and

displaying an image at the magnification for observing the object in accordance with the stored data.

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4. (previously presented): The method as claimed in claim 1, wherein the predetermined period is shorter when the magnification is higher.
5. (original): The method as claimed in claim 1, wherein, when the magnification is higher than a threshold magnification that is stored in the scanning electron microscope in advance, electrons are detected during the predetermined period in accordance with the magnification.
6. (original): The method as claimed in claim 5, wherein the threshold magnification is determined in accordance with an error distribution of measured values obtained by measuring a test pattern at different magnifications.
7. (original): The method as claimed in claim 6, wherein measured values of the test pattern are sequentially set so that the magnification monotonically increases or decreases.
8. (original): The method as claimed in claim 5, wherein a second magnification is selected as the threshold magnification when a difference between a first measured value obtained at a first magnification and a second measured value obtained at the second magnification smaller than the first magnification exceeds a predetermined value.
9. (currently amended): A method of controlling a scanning electron microscope, the method comprising the steps of:
- irradiating a surface of a sample object with ~~an~~ a primary electron beam; and
 - detecting secondary electrons released from the surface of the sample object due to the irradiation,
- wherein:

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a first scanning range in a first direction of two different directions on the surface of the sample object is selected in accordance with a detection magnification on the surface of the sample object, while a second scanning range in a second direction of the two different directions is fixed; and

the secondary electron detection is performed at intervals $T = (FOV1/FOV2) \times t1$, with the a first portion of the second scanning range being FOV1, the entire second scanning range being FOV2, and an initial value of the intervals being t1.

10. (original): The method as claimed in claim 9, wherein, among all data obtained as a result of the detection, data corresponding to a ratio of FOV1/FOV2 is extracted as image data, and an image at the detection magnification on the surface of the sample object is displayed based on the image data.

11. (currently amended): The method as claimed in claim 9, wherein:
a switching time B is determined by $S/(FOV1/FOV2)$, with an a primary electron beam scanning time S;
only data obtained by detecting secondary electrons during a period between the switching time B after a scanning start and a time 2B are stored; and
an image is displayed at a magnification on the surface of the sample object in accordance with the data.

12. (currently amended): A scanning electron microscope, comprising:
an irradiating unit that irradiates an object with an a primary electron beam swept, in a scanning direction, over a fixed scanning range length; and
a detecting unit that detects secondary electrons released from the object due to the irradiation during a predetermined period constituting a portion of an a fixed primary electron

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beam scanning time, the primary electron beam scanning time comprising a single sweep of the primary electron beam in the scanning direction over the fixed scanning range length,

wherein the predetermined period is changed depending on a magnification at which the object is observed, without changing a scanning rate of the primary electron beam across the surface of the object.

13. (currently amended): The scanning electron microscope as claimed in claim 12, further comprising:

a data extracting unit that extracts image data by an inverse number rate of the magnification from all data obtained as a result of [[the]] secondary election detection; and

a display unit that displays an image at the magnification for observing the object in accordance with the extracted image data.

14. (original): The scanning electron microscope as claimed in claim 12, further comprising:

a data storing unit that stores only data obtained during the predetermined period of time corresponding to the magnification, from all data obtained as a result of the detection; and

a display unit that displays an image at the magnification for observing the object, in accordance with the stored data.

15. (previously presented): The scanning electron microscope as claimed in claim 12, wherein the predetermined period is shorter when the magnification is higher.

16. (original): The scanning electron microscope as claimed in claim 15, further comprising a storage unit that stores a threshold magnification in advance,

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wherein the detecting unit detects electrons during the predetermined period depending on a magnification that is higher than the threshold magnification stored in the storage unit.

17. (original): The scanning electron microscope as claimed in claim 16, further comprising a threshold magnification determining unit that calculates an error distribution of measured values obtained by measuring a test pattern at different magnifications, and determines the threshold magnification depending on the error distribution.

18. (original): The scanning electron microscope as claimed in claim 17, wherein the threshold magnification determining unit sequentially sets the magnification when the test pattern is measured, so that the magnification monotonically increases and decreases.

19. (original): The scanning electron microscope as claimed in claim 16, wherein, when a difference between a first measured value obtained at a first magnification and a second measured value obtained at a second magnification exceeds a predetermined value, the second magnification is stored as the threshold magnification in the storage unit.

20. (currently amended): A scanning electron microscope that irradiates a surface of a sample object with ~~an~~ a primary electron beam so as to detect secondary electrons released from the surface of the sample object due to the irradiation, said microscope comprising:

a scanning unit that determines a first scanning range in a first direction of two different directions on the surface of the sample object in accordance with a detection magnification for the surface of the sample object, while maintaining a second scanning range in a second direction of the two different directions constant; and

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a detection timing determining unit that determines intervals T for detecting secondary electrons by $(FOV1/FOV2) \times t1$, the a first portion of the second scanning range being FOV1, the entire second scanning range being FOV2, and an initial value of detection intervals being $t1$.

21. (currently amended): The scanning electron microscope as claimed in claim 20, further comprising:

a data extracting unit that extracts data corresponding to a ratio of FOV1/FOV2 as image data from all data obtained as a result of [[the]] secondary election detection; and

a display unit that displays an image based on the image data at the detection magnification for the surface of the sample object.

22. (previously presented): The scanning electron microscope as claimed in claim 20, further comprising:

a switching time calculating unit that determines a switching time B by $S/(FOV2/FOV1)$, with an electron beam scanning time being S ;

a data storage unit that stores data obtained by detecting electrons only during a period between the switching time B after a scanning start and a time $2B$; and

a display unit that displays an image at the magnification for the surface of the sample object based on the data stored in the data storage unit.

23. (currently amended): A method of controlling a scanning microscope, comprising the steps of:

irradiating an object with ~~an~~ a primary electron beam focused on a surface of the object, the electron beam having an electron current density corresponding to a first magnification factor on a surface of the object;

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detecting secondary electrons emitted from the object in response to an irradiation of the object with the electron beam;

acquiring a two-dimensional image of the object with the first magnification factor, by sampling the secondary electrons during a predetermined first period constituting a portion of an a primary electron beam scanning time, corresponding to the first magnification factor;

selecting a region in the two-dimensional image;

scanning the selected region with the electron beam, the electron beam having the electron current density on the surface of the object;

detecting the secondary electrons emitted from the region in response to an irradiation of the region with the electron beam;

acquiring a two-dimensional image of the region with a second, larger magnification factor, by sampling the electron beam during a predetermined second period constituting a portion of an electron beam scanning time, corresponding to the second magnification factor, the second period being smaller than the first period, wherein the predetermined first period and the predetermined second period are changed without changing a scanning rate of the electron beam.

24. (original): The method as claimed in claim 23, further comprising the steps of:
selecting a sub-region in the two-dimensional image of the region; and
producing a two-dimensional image of the sub-region, by eliminating data of the two-dimensional image of the region outside the sub-region.

25. (original): The method as claimed in claim 23, further comprising the step of measuring a pattern size based on the two-dimensional image of the sub-region.